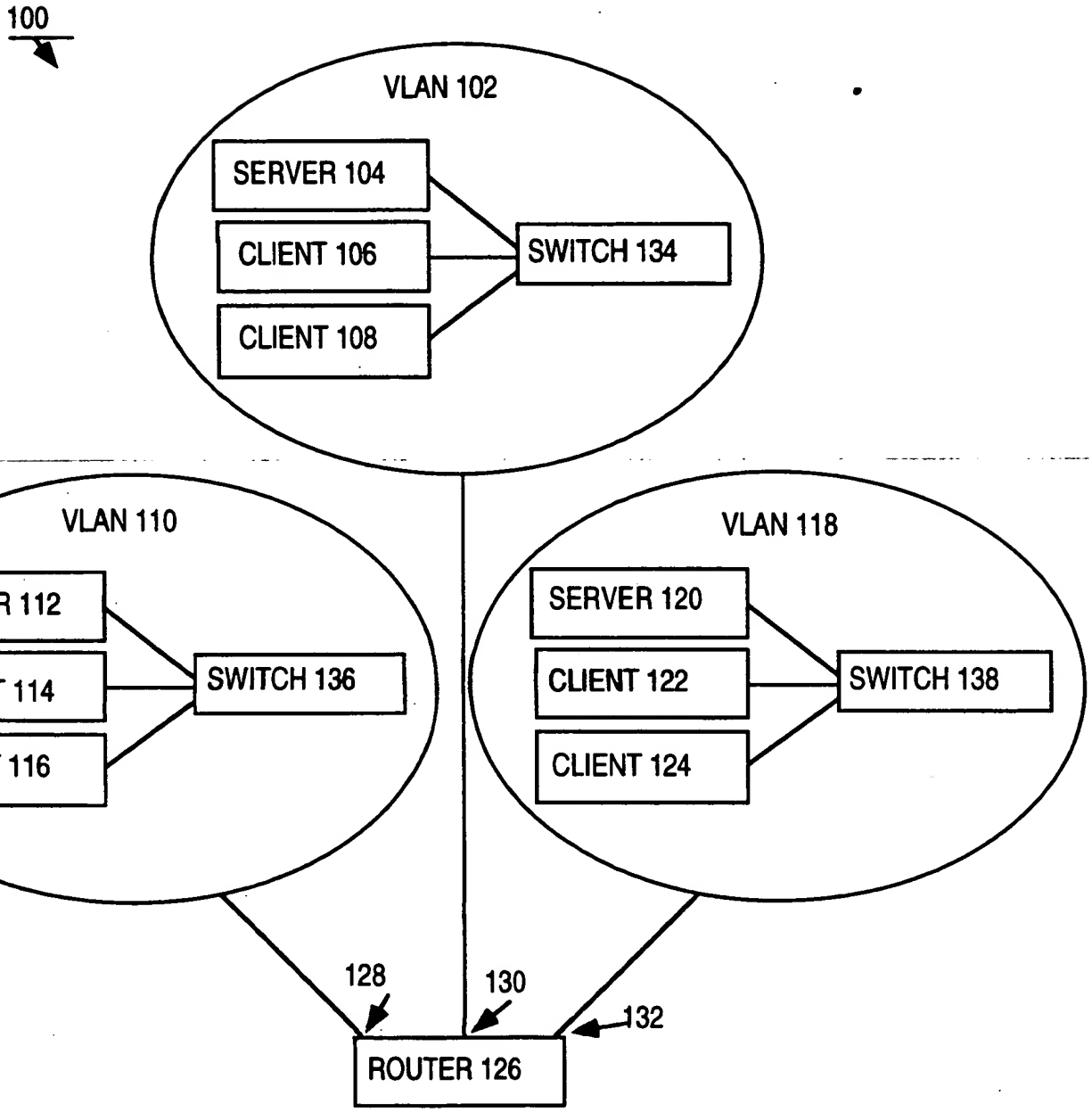

FIGURE 1
(PRIOR ART)

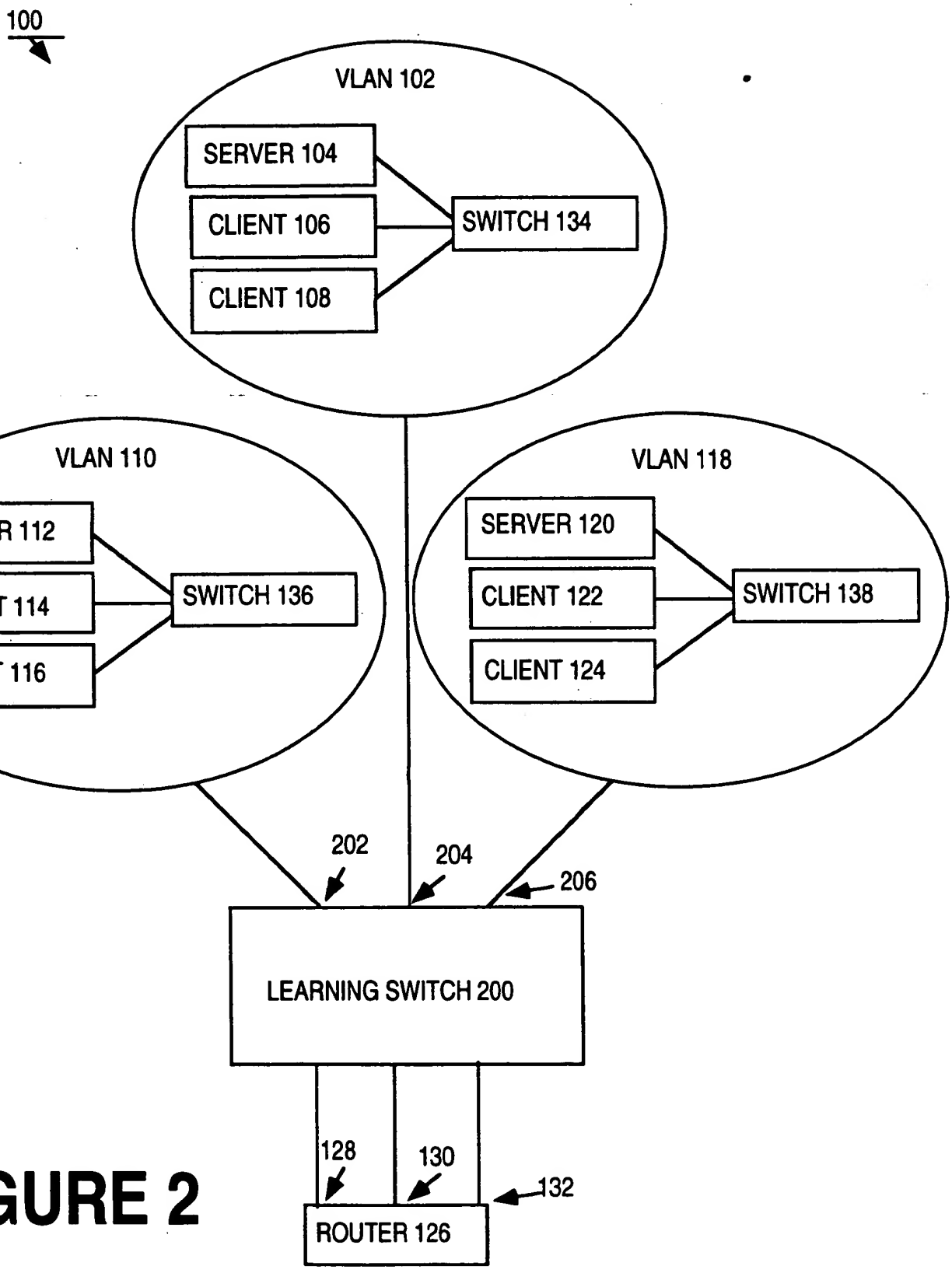
100
VLAN 102
SERVER 104
CLIENT 106
CLIENT 108
SWITCH 134
VLAN 110
SERVER 112
CLIENT 114
CLIENT 116
SWITCH 136
VLAN 118
SERVER 120
CLIENT 122
CLIENT 124
SWITCH 138
202
204
206
LEARNING SWITCH 200
128
130
132
ROUTER 126

FIGURE 2

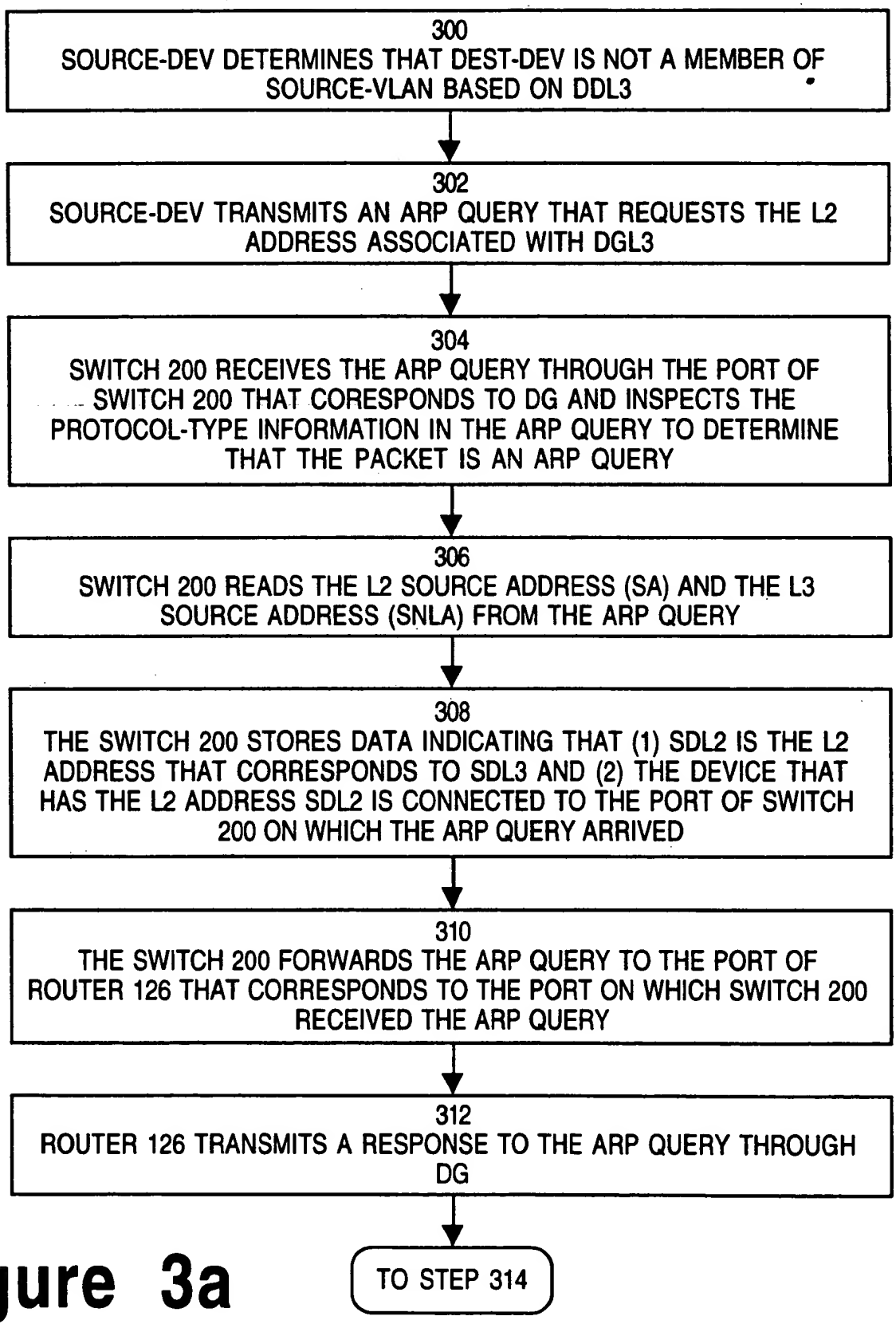
300
SOURCE-DEV DETERMINES THAT DEST-DEV IS NOT A MEMBER OF SOURCE-VLAN BASED ON DDL3
302
SOURCE-DEV TRANSMITS AN ARP QUERY THAT REQUESTS THE L2 ADDRESS ASSOCIATED WITH DGL3
304
SWITCH 200 RECEIVES THE ARP QUERY THROUGH THE PORT OF SWITCH 200 THAT CORESPONDS TO DG AND INSPECTS THE PROTOCOL-TYPE INFORMATION IN THE ARP QUERY TO DETERMINE THAT THE PACKET IS AN ARP QUERY
306
SWITCH 200 READS THE L2 SOURCE ADDRESS (SA) AND THE L3 SOURCE ADDRESS (SNLA) FROM THE ARP QUERY
308
THE SWITCH 200 STORES DATA INDICATING THAT (1) SDL2 IS THE L2 ADDRESS THAT CORRESPONDS TO SDL3 AND (2) THE DEVICE THAT HAS THE L2 ADDRESS SDL2 IS CONNECTED TO THE PORT OF SWITCH 200 ON WHICH THE ARP QUERY ARRIVED
310
THE SWITCH 200 FORWARDS THE ARP QUERY TO THE PORT OF ROUTER 126 THAT CORRESPONDS TO THE PORT ON WHICH SWITCH 200 RECEIVED THE ARP QUERY
312
ROUTER 126 TRANSMITS A RESPONSE TO THE ARP QUERY THROUGH DG
TO STEP 314

Figure 3a

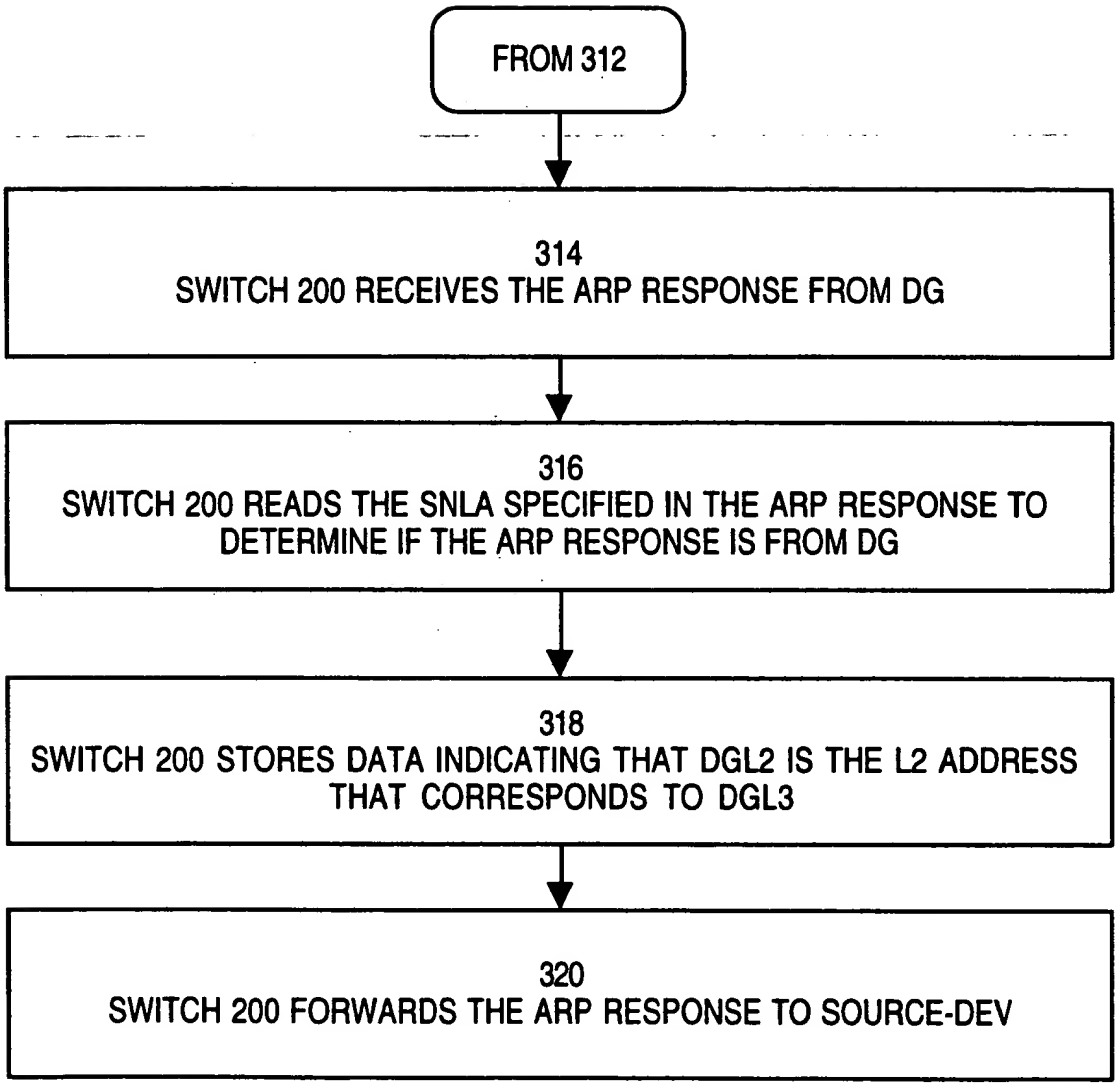
FROM 312
314
SWITCH 200 RECEIVES THE ARP RESPONSE FROM DG
316
SWITCH 200 READS THE SNLA SPECIFIED IN THE ARP RESPONSE TO DETERMINE IF THE ARP RESPONSE IS FROM DG
318
SWITCH 200 STORES DATA INDICATING THAT DGL2 IS THE L2 ADDRESS THAT CORRESPONDS TO DGL3
320
SWITCH 200 FORWARDS THE ARP RESPONSE TO SOURCE-DEV

Figure 3b

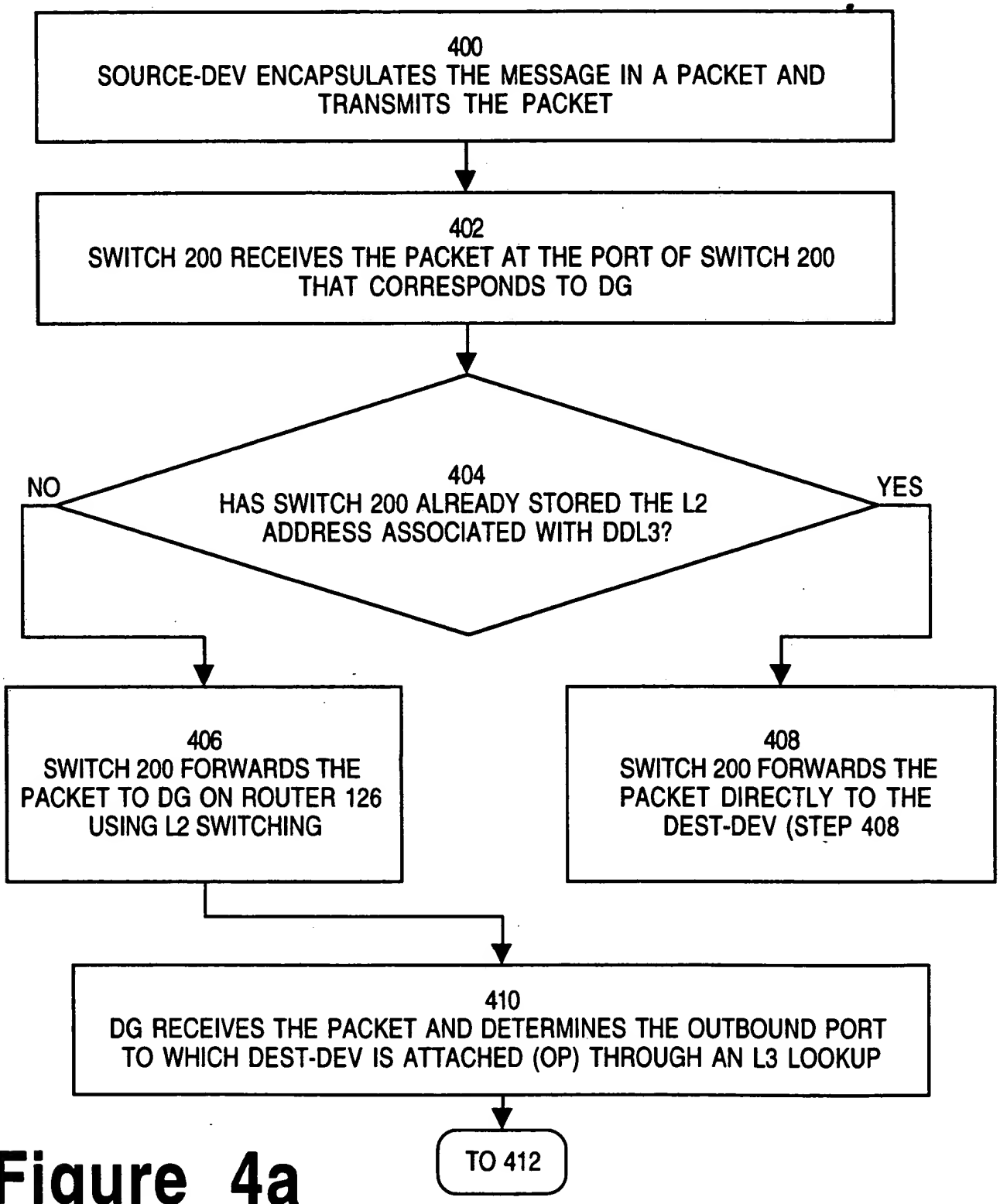
400
SOURCE-DEV ENCAPSULATES THE MESSAGE IN A PACKET AND TRANSMITS THE PACKET
402
SWITCH 200 RECEIVES THE PACKET AT THE PORT OF SWITCH 200 THAT CORRESPONDS TO DG
404
HAS SWITCH 200 ALREADY STORED THE L2 ADDRESS ASSOCIATED WITH DDL3?
NO
YES
406
SWITCH 200 FORWARDS THE PACKET TO DG ON ROUTER 126 USING L2 SWITCHING
408
SWITCH 200 FORWARDS THE PACKET DIRECTLY TO THE DEST-DEV (STEP 408
410
DG RECEIVES THE PACKET AND DETERMINES THE OUTBOUND PORT TO WHICH DEST-DEV IS ATTACHED (OP) THROUGH AN L3 LOOKUP
TO 412

Figure 4a

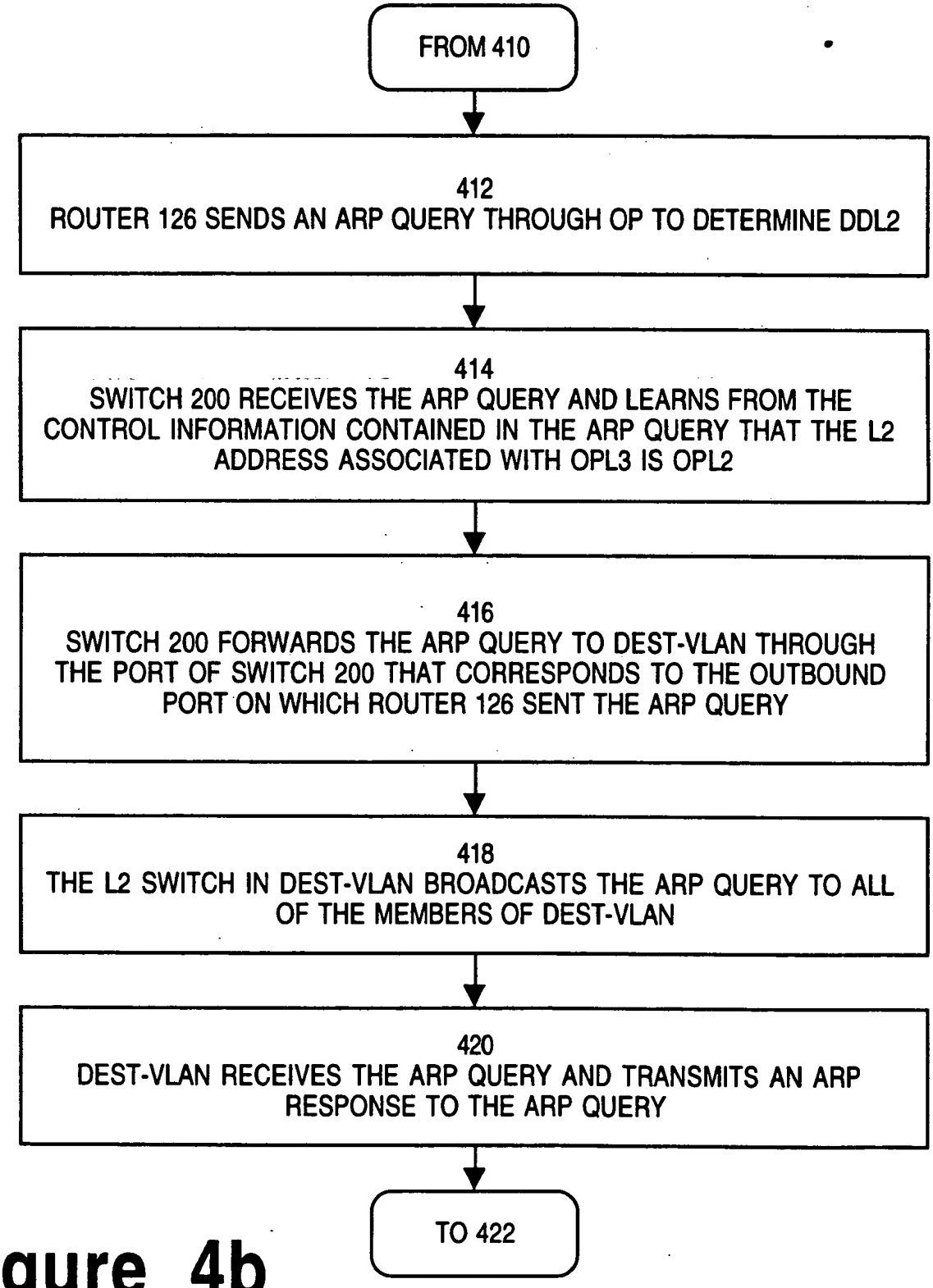
FROM 410
412
ROUTER 126 SENDS AN ARP QUERY THROUGH OP TO DETERMINE DDL2
414
SWITCH 200 RECEIVES THE ARP QUERY AND LEARNS FROM THE CONTROL INFORMATION CONTAINED IN THE ARP QUERY THAT THE L2 ADDRESS ASSOCIATED WITH OPL3 IS OPL2
416
SWITCH 200 FORWARDS THE ARP QUERY TO DEST-VLAN THROUGH THE PORT OF SWITCH 200 THAT CORRESPONDS TO THE OUTBOUND PORT ON WHICH ROUTER 126 SENT THE ARP QUERY
418
THE L2 SWITCH IN DEST-VLAN BROADCASTS THE ARP QUERY TO ALL OF THE MEMBERS OF DEST-VLAN
420
DEST-VLAN RECEIVES THE ARP QUERY AND TRANSMITS AN ARP RESPONSE TO THE ARP QUERY
TO 422

Figure 4b

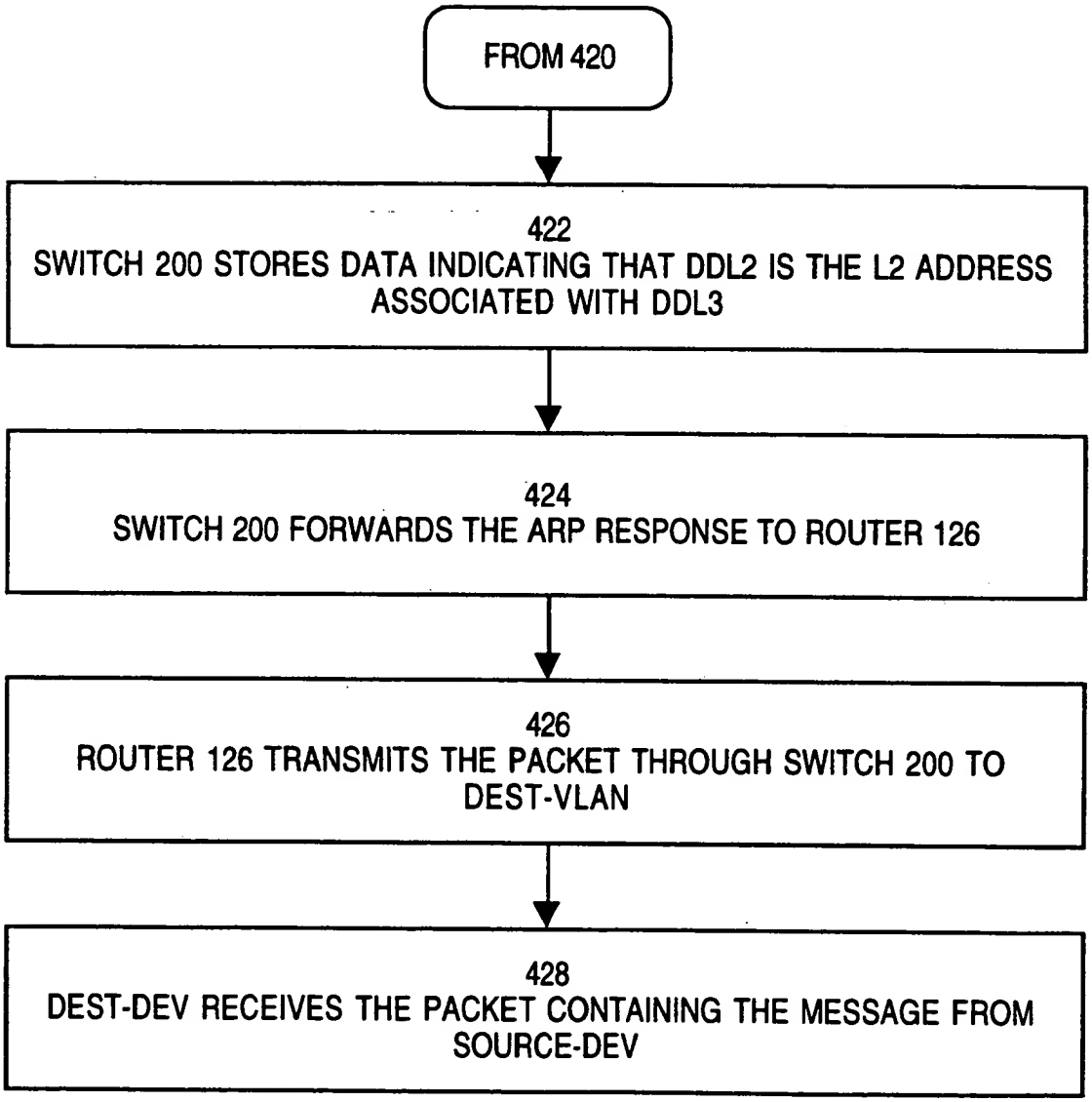
FROM 420
422
SWITCH 200 STORES DATA INDICATING THAT DDL2 IS THE L2 ADDRESS ASSOCIATED WITH DDL3
424
SWITCH 200 FORWARDS THE ARP RESPONSE TO ROUTER 126
426
ROUTER 126 TRANSMITS THE PACKET THROUGH SWITCH 200 TO DEST-VLAN
428
DEST-DEV RECEIVES THE PACKET CONTAINING THE MESSAGE FROM SOURCE-DEV

Figure 4c

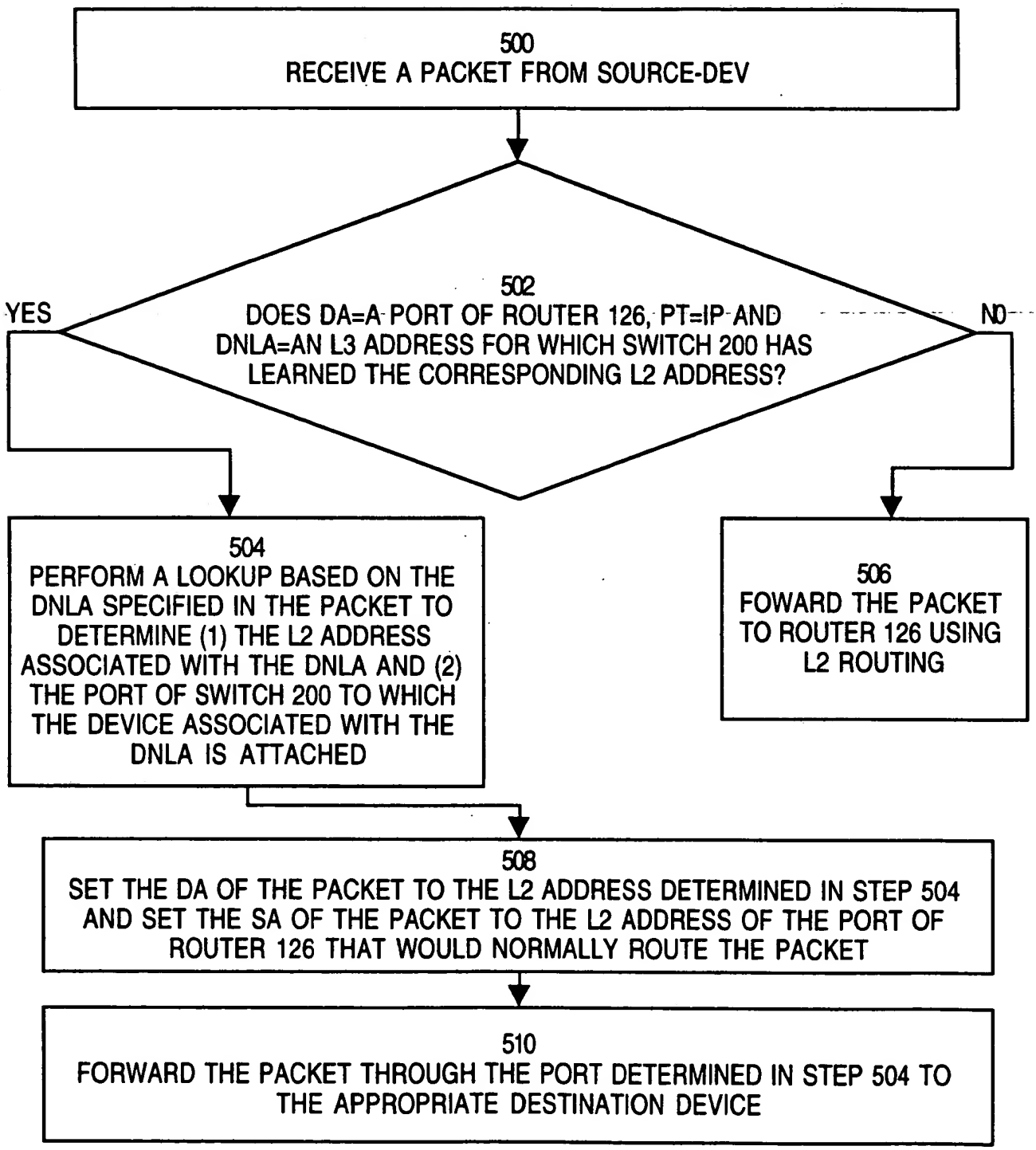
500
RECEIVE A PACKET FROM SOURCE-DEV
502
DOES DA=A PORT OF ROUTER 126, PT=IP AND DNLA=AN L3 ADDRESS FOR WHICH SWITCH 200 HAS LEARNED THE CORRESPONDING L2 ADDRESS?
YES
NO
504
PERFORM A LOOKUP BASED ON THE DNLA SPECIFIED IN THE PACKET TO DETERMINE (1) THE L2 ADDRESS ASSOCIATED WITH THE DNLA AND (2) THE PORT OF SWITCH 200 TO WHICH THE DEVICE ASSOCIATED WITH THE DNLA IS ATTACHED
506
FOWARD THE PACKET TO ROUTER 126 USING L2 ROUTING
508
SET THE DA OF THE PACKET TO THE L2 ADDRESS DETERMINED IN STEP 504 AND SET THE SA OF THE PACKET TO THE L2 ADDRESS OF THE PORT OF ROUTER 126 THAT WOULD NORMALLY ROUTE THE PACKET
510
FORWARD THE PACKET THROUGH THE PORT DETERMINED IN STEP 504 TO THE APPROPRIATE DESTINATION DEVICE

Figure 5

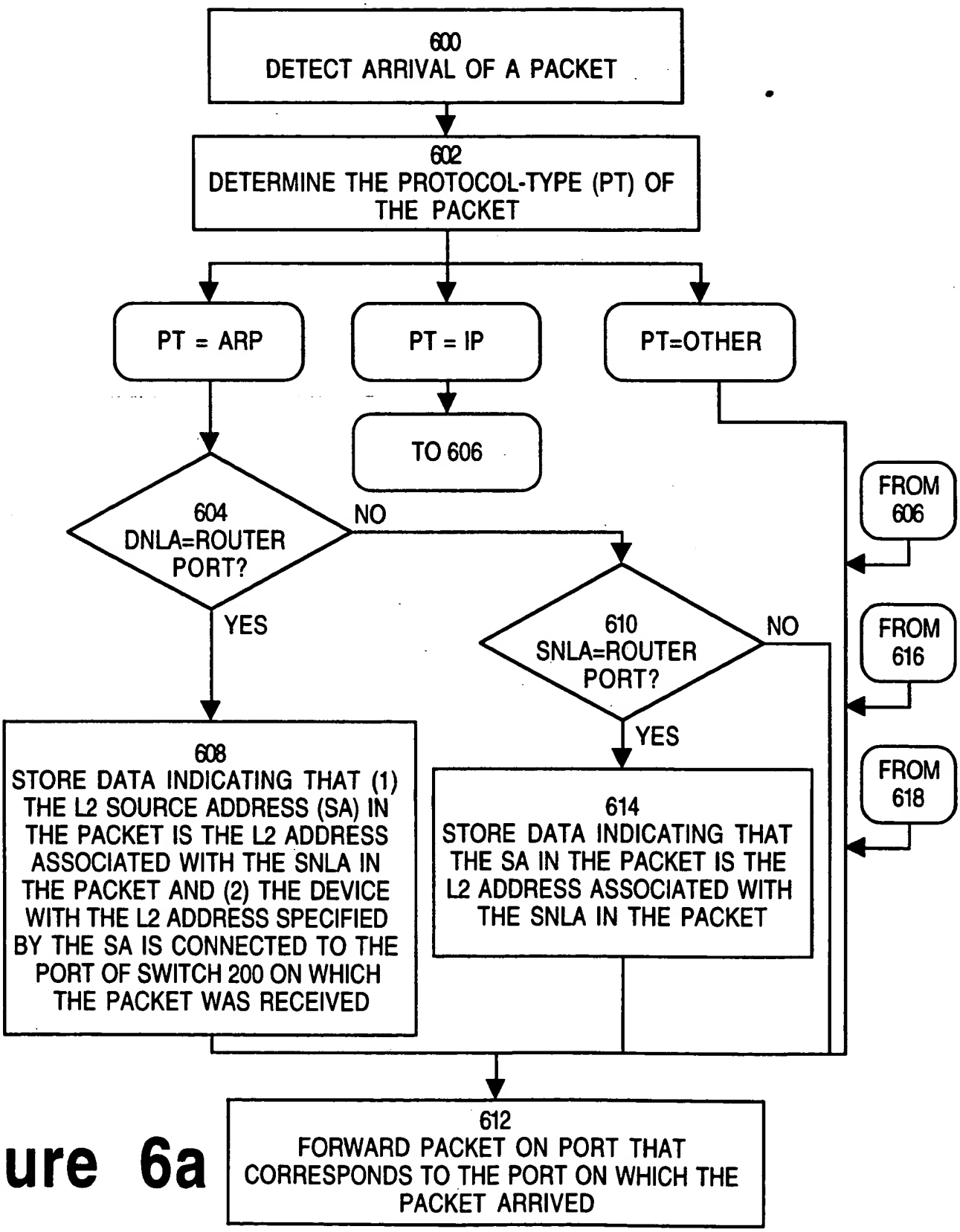
600
DETECT ARRIVAL OF A PACKET
602
DETERMINE THE PROTOCOL-TYPE (PT) OF THE PACKET
PT = ARP
PT = IP
PT=OTHER
TO 606
604
DNLA=ROUTER PORT?
NO
YES
610
SNLA=ROUTER PORT?
NO
YES
FROM 606
FROM 616
FROM 618
608
STORE DATA INDICATING THAT (1) THE L2 SOURCE ADDRESS (SA) IN THE PACKET IS THE L2 ADDRESS ASSOCIATED WITH THE SNLA IN THE PACKET AND (2) THE DEVICE WITH THE L2 ADDRESS SPECIFIED BY THE SA IS CONNECTED TO THE PORT OF SWITCH 200 ON WHICH THE PACKET WAS RECEIVED
614
STORE DATA INDICATING THAT THE SA IN THE PACKET IS THE L2 ADDRESS ASSOCIATED WITH THE SNLA IN THE PACKET
612
FORWARD PACKET ON PORT THAT CORRESPONDS TO THE PORT ON WHICH THE PACKET ARRIVED

Figure 6a

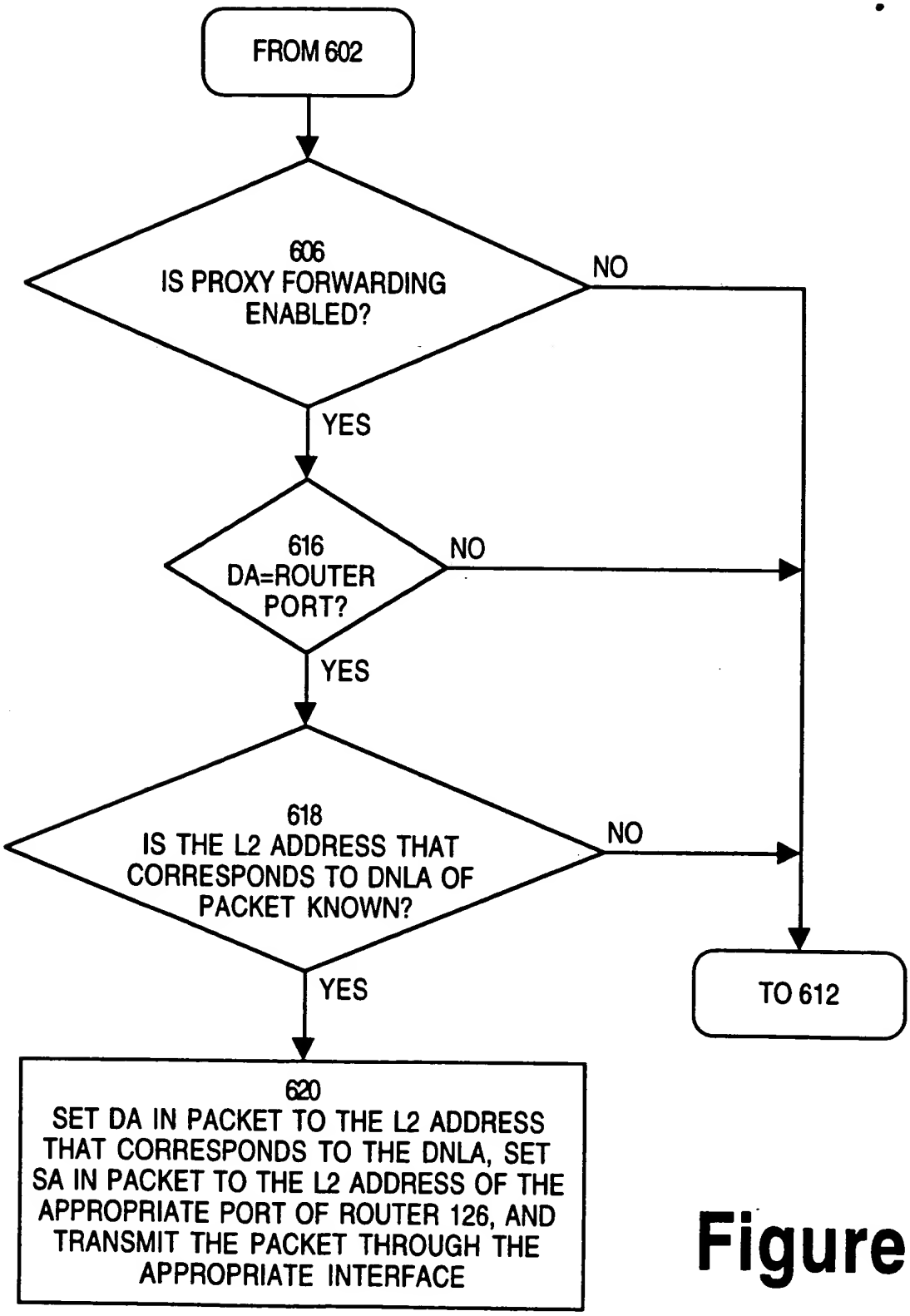
FROM 602
606
IS PROXY FORWARDING ENABLED?
NO
YES
616
DA=ROUTER PORT?
NO
YES
618
IS THE L2 ADDRESS THAT CORRESPONDS TO DNLA OF PACKET KNOWN?
NO
YES
TO 612
620
SET DA IN PACKET TO THE L2 ADDRESS THAT CORRESPONDS TO THE DNLA, SET SA IN PACKET TO THE L2 ADDRESS OF THE APPROPRIATE PORT OF ROUTER 126, AND TRANSMIT THE PACKET THROUGH THE APPROPRIATE INTERFACE

Figure 6b